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IS 11000-1-3 (1993): Fire Hazard Testing, Part 1: Guidance for the Preparation of Requirements Test Specifications for Assessing Fire Hazard of Electronic and Electrical Items, Section 3: Guidance for Use of Preselection Procedures [LITD 1: Environmental Testing Procedure]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

FIRE HAZARD TESTING

**PART 1 GUIDANCE FOR THE PREPARATION OF REQUIREMENTS AND
TEST SPECIFICATIONS FOR ASSESSING FIRE HAZARD OF
ELECTRONIC AND ELECTRICAL ITEMS**

Section 3 Guidance for Use of Preselection Procedures

UDC 621.31 : 620.193.5

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NATIONAL FOREWORD

This Indian Standard, which is identical with IEC Pub 695-1-3 (1985) 'Fire hazard testing — Part 1 : Guidance for the preparation of requirements and test specifications for assessing fire hazard of electrotechnical products, Guidance for use of preselection procedures', issued by the International Electrotechnical Commission, was adopted by the Bureau of Indian Standards on the recommendation of Environmental Testing Procedures Sectional Committee (LTD 02) and approval of the Electronics and Telecommunication Division Council.

The text of the IEC standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

Wherever the words 'International Standard' appear, referring to this standard, they should be read as 'Indian Standard'.

In the adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

<i>International Standards</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC Pub 695-1-1 (1982), Fire hazard testing, Part 1 : Guidance for the preparation of requirements and test specifications for assessing fire hazard of electrotechnical products. General guidance	IS 11000 (Part 1/Sec 1) : 1988 Fire hazard testing : Part 1 Guidance for the preparation of requirements and test specifications for assessing fire hazard of electronic and electrical items, Section 1 General guidance	Technically equivalent
IEC Pub 695-2-1 (1980), Fire hazard testing, Part 2 : Test methods, glow-wire test and guidance	IS 11000 (Part 2/Sec 1) : 1984 Fire hazard testing : Part 2 Test methods, Section 1 Glow-wire test and guidance.	Identical
IEC Pub 695-2-2 (1980), Fire hazard testing, Part 2 : Needle-flame test	IS 11000 (Part 2/Sec 2) : 1984 Fire hazard testing : Part 2 Test methods, Section 2 Needle-flame test	Identical

The concerned technical committee has reviewed the provisions of IEC 112 (1979), IEC 332-1 (1979), IEC 380 (1977), IEC 587 (1984), IEC 695-2-3 (1984), IEC 695-3-1 (1982) and IEC 707 (1981), referred in this standard and has decided that they are acceptable for use in conjunction with this standard.

Part 1 of this Indian Standard deals with guidance for assessing fire hazards of electrotechnical products. The subsequent parts are intended to deal with the following:

- a) Test methods,
- b) Examples of test procedures and interpretation of results,
- c) Terminology, and
- d) Survey of test methods.

Only the English language text in the International Standard has been retained while adopting it in this Indian Standard.

Indian Standard

FIRE HAZARD TESTING

PART 1 GUIDANCE FOR THE PREPARATION OF REQUIREMENTS AND TEST SPECIFICATIONS FOR ASSESSING FIRE HAZARD OF ELECTRONIC AND ELECTRICAL ITEMS

Section 3 Guidance for Use of Preselection Procedures

1. Introduction and scope

This standard should be read in conjunction with IEC Publication 695-1-1: Fire Hazard Testing, Part 1: Guidance for the Preparation of Requirements and Test Specifications for Assessing Fire Hazard of Electrotechnical Products — General Guidance.

The best method for testing electrotechnical products with regard to fire hazard is to duplicate exactly the conditions occurring in practice. Where this is not practicable, fire hazard testing should be conducted by simulating as closely as possible the actual conditions of use of a product and of the situation to which a material, component or sub-assembly may be exposed in such use.

Preselection may be made on the basis of specified tests and by the use of specifications of the necessary resistance to fire and related combustion characteristics.

In this standard:

- the term “end-product test” means a fire hazard assessment test on a completed product. This may be a piece part, component, or sub-assembly;
- the term “preselection test” means a combustion characteristic test made on a material, piece part, component or sub-assembly that goes to make up a final end-product.

The information gained from properly designed small-scale tests can be used as an aid during the design stage of a product, for preselection of proper materials, components or sub-assemblies in regard to the fire hazard evaluation of the completed product. Priority shall be given to fire hazard assessment tests made on the completed product; however, in certain cases preselection tests may be agreed upon for practical reasons.

It should be noted that in some cases all the necessary information for preselection may be provided by the requirements of the specification for the material, part, component, or sub-assembly.

The following guidance is intended to relate the specific function of the electrotechnical product, its sub-assemblies and its parts to the tested properties of materials and to demonstrate the significance and the limitations of such a preselection procedure.

2. Hazard concept

The fire hazard of electrotechnical products depends upon the selection and arrangement of materials, components and sub-assemblies and upon the processing, assembly and relative positions of these items.

The required properties as outlined in Clause 2 of IEC Publication 695-1-1 can generally be achieved by using parts and/or circuit-design and protection techniques that in conditions of overload or failure avoid ignition or restrict propagation of fire and spread of flame should ignition occur.

The results of relevant combustion characteristic tests may provide the necessary information to indicate that the complete product will meet some of the product requirements. It is emphasized, that preselection in this way needs careful consideration to ensure that the tests used are significant in relation to the application and to avoid misuse and wrong interpretation.

3. Main objectives

Knowledge of materials can be obtained from an analysis of data obtained from standardized test methods conducted on small test pieces. Combustion characteristics which provide information related to the burning behaviour of materials are described in IEC Publication 695-3-1: Fire Hazard Testing, Part 3: Examples of Fire Hazard Assessment Procedures and Interpretation of Results. Combustion Characteristics and Survey of Test Methods for their Determination, and appropriate tests are listed therein.

The properties needed by individual parts are determined by the function or functions of the part. The actual performance of a part in a product is affected by such things as thickness, shape and size of the parts, heat transfer effects because of assembly, heat sinks, and the type of ignition source and period of exposure.

These properties may also be affected by reasonable foreseeable use, abuse and environmental exposure. Consequently, a preselection procedure to be used for simplification of fire hazard assessment of an end-product requires preselection test on materials, parts, components or sub-assemblies, modelling all the important features (e.g. the environmental conditions, association with other items, ignition sources).

Such a preselection procedure may present certain advantages:

- a) A material which reacts more favourably than another when tested as a standard specimen will usually also react more favourably when used as a finished part in the product, provided that possible synergistic effects are avoided.
- b) Data concerning relevant combustion characteristics can aid the selection of materials, components and sub-assemblies during the design stage.
- c) The reproducibility of preselection tests is usually higher, and their sensitivity may be superior when compared with end-product tests.
- d) Preselection tests may be used in a decision-making process directed to minimize the fire hazard. Where applicable for the purpose of fire hazard assessment they may lead to a reduction in the number of end-product tests with a consequent reduction in the total testing time. It should be noted that when preselection testing is used to replace some of the end-product testing, it is necessary to fix an increased margin of safety in an attempt to ensure satisfactory performance of the end-product. End-product testing may avoid restrictions in innovative design and in economic material selection imposed by a preselection procedure.

- e) When a Technical Committee needs to upgrade fire hazard requirements quickly it may be possible to do this by upgrading the requirements of a preselection test before modifying the end-product test.
- f) The grading and classification obtained from the preselection test results may be used to specify a basic minimum performance of materials used in product specifications.

4. Significant aspects

For the purpose of fire hazard assessment the combustion characteristics of a tested item are the properties usually considered in a preselection procedure.

The most important aspects in regard to the significance and limitations of the relevant preselection tests are given in the following list.

Significant aspects are:

- thickness
 - shape and volume
 - position and orientation
- } of the specimen
- combination and interaction of materials
 - effects of environmental influences and contamination, i.e. effects of temperature, ageing, ventilation
 - effects of manufacturing process on parts
- place of application
 - type and energy
 - time of application
- } of the ignition source

Note. — Some of these aspects may be reasonably covered by the preselection test itself, others may require careful interpretation of a result in regard to evaluation of the fire hazard.

5. Evaluation of the fire hazard

Preselection of materials on the basis of the results obtained by combustion characteristic tests may be used in the decision making process related to fire hazard assessment only when the aspects shown in Clause 4 are adequately covered. This can be achieved either by correctly modelling all important conditions in the test method itself or by careful comparison of the demanded combustion characteristics with related functions of the electrotechnical product. Confirmation of modelling accuracy for some aspects may need to be verified by preliminary end-product tests, to ensure that the preselection procedure is applicable.

The type and energy of the ignition source should ideally give the same severity in the combustion characteristic test as in the fire hazard assessment test. It will be helpful to review past history and experience in selecting proper severities and acceptance criteria.

6. List of ignition sources issued for preselection procedures

The following list is not considered to be exhaustive.

<i>Ignition source</i>	<i>IEC Publication*</i>
Bad-connection heater	695-2-3
Incandescent bar	707

* See titles in the preface.

Glow-wire	695-2-1
Hot wire coil	380
High current arc	380
Tracking current	112, 587
Needle-flame	695-2-2
Bunsen type flames	
20 mm high	707
25 mm high	707
175 mm high	332-1

Note. — The Oxygen Index Test specified in ISO Standard 4589 is also used for preselection.

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